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Thelaziasis: Biology, Species Affected and Pathology (Conjunctivitis): A Review

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Abstract: Thelaziasis is an infestation caused by the parasite *Thelazia* which is transmitted from one host to another host by the intermediate host face fly. Face fly is a non-penetrate secreto- phagic or tear feeding flies of the genera *Musca*. *Thelazia* is a genus of parasitic round worms that affects the eyes of numerous domestic animals, including cattle, dogs, cats, sheep, goats and other livestock. Many wild mammals and birds are affected as well as human. Predilection site of adult Thelazia worms are the eyes and the tissues around it. *Thelazia* is a creamy-white slender-shaped ecto- and endo-parasite which measures up to 8-12 mm in males and 12-18 mm in females. The females are viviparous and L1, released into the lachrymal secretions of the definitive host. Both adult and larval stages live in eyes and cause conjunctivitis, keratitis, lacrimation and ocular discharge. Various clinical signs are associated with thelaziasis including keratitis, conjunctivitis, lacrimation, epiphora, photophobia and corneal opacity *Thelazia* infections occur seasonally and are linked to periods of maximum fly activity. Adult worms can be removed with fine forceps and by using cotton swabs under local anesthesia. Pharmacological indications include irrigation of the eyes with 50-75 ml aqueous solution of 0.5 % iodine and 0.75% potassium iodide has been recommended for *T. gulosa* and *T. skrjabini* or applied steroid ointment, fenbendazole and Ivermectin subcutaneously.

Key words: Thelazia · Bovine · Etiology · Pathology

INTRODUCTION

Thelazia is a genus of parasitic round worms that affects the eyes of numerous domestic animals, including cattle, dogs, cats, sheep, goats and other livestock. Many wild mammals and birds are affected as well. Predilection site of adult Thelazia worms are the eyes and the tissues around it (eye lids, lacrimal ducts and glands [1-2].

T*helazia californiensis* affects dogs and cats, very occasionally humans as well. It is found in Western North America. *Thelazia callipaeda* affects dogs and cats, very occasionally humans as well. It occurs in the Far East, Russia and other parts of Europe. Thelazia gulosa affects mainly cattle, less often sheep and goats. Found in Asia, Europe and North America. *Thelazia lacrymalis* affects horses. Found worldwide. Thelazia rhodesi affects mainly cattle, less often sheep, goats and horses, very occasionally humans as well. Found in Africa, Asia and Europe. Thelazia skrjabini affects mainly cattle, less often sheep and goats. Found in Europe and North America [3-6].

Morphology of the Parasite: *Thelazia* is a creamy-white slender-shaped ecto- and endo-parasite which measures up to 8-12 mm in males and 12-18 mm in females. It is a round tapering on both side in which the anterior sucker end and posterior excretory portion is tapered. The cuticle bears prominent transverse striations. The male *Thelazia* is identified by ventral curving of the posterior end and by the number of pre-and post-cloacal papillae. The spicules are 0.75-0.85 and 0.115-0.13 mm long. Whereas female Thelazia distinguished from male and from different species by the position of vulva and oesophago-intestinal junction.*Thelazia* species have morphological differences such as location of the vaginal

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opening, the number of cuticular transverse striations and the number of caudal papillae. The egg is very small and colorless; first-stage larvae (L1) formed special structure like lungworm inside the shell [7-9].

Life Cycle: The females are viviparous and L1, released into the lachrymal secretions of the definitive host. The life cycle is indirect and several non-biting dipteran flies of the genus *Musca* (Muscidae), which feed on animal ocular secretions, act as intermediate hosts [10-11]. The flies became infected when feeding on the lachrymal secretions which contain larvae. The larvae, once in the abdomen of the fly, leave the digestive system and enter the haemocoel. In the fly body, the parasites go through two moults and develop to the infective third stage and the infective third-stage larvae (L3) are released in the conjunctival sac of receptive hosts. This development occurs in capsules of uncertain origin within the abdomen [9-10 and 12-13]. *Thelazia lacrymalis* can reach the infective stage in 12-15 days Lyons, *et al*., [22] while this takes 28- 32 days for *T. gulosa* [12]. The infective larvae migrate to the head and exit through the mouthparts while the flies feed on the eye exudates [14]. Within 3-6 weeks the larvae mature and the adult worms deposit their ova into the conjunctional sac and lacrimal ducts of the new host. In the definitive host, *Thelazia* have been found in various tissues of the orbit (socket) of the eye including within the eyelids, in the tear glands, tear ducts, third eyelid (nictating membrane) or in the eyeball itself [15].

Pathogenesis: Localized irritation and inflammation is likely due to the serrated cuticle of the worms, especially for *T. rhodesi* [10]. Invasion of the lachrymal gland and excretory ducts may cause inflammation and necrotic exudation. Mild to severe conjunctivitis and blepharitis are common. Also, keratitis, including opacity, ulceration, perforation and permanent fibrosis, may develop in severe cases, particularly with *T. rhodesi* infections in cattle [10]. Both adult and larval stages live in eyes and cause conjunctivitis, keratitis, lacrimation and ocular discharge [7, 16].

Adult parasites are found behind and in the nictitating membrane, lacrimal and naso-lacrimal ducts and on the surface of the conjunctiva. However, in many cases eyeworms have practically no pathogenic effect on the host, especially in the larger animals. However, there can be no doubt that the parasites do cause disease of the eye. Lesions may occur in one or both eyes; initially there is a mild conjunctivitis which may progress to congestion of the conjunctiva and the cornea. As the condition becomes more serious the cornea becomes cloudy, there is marked lacrimation and the affected eye becomes markedly swollen and covered with exudates and pus. Without treatment a progressive keratitis occurs, there is ulceration of the cornea leading to protrusion of the contents of the anterior chamber [7, 9].

Epidemiology: A number of species of the nematode genus *Thelazia* occur in the conjunctival sac and tear ducts of mammals throughout the world. *Thelazia* spp. are common parasites of cattle, horses, buffalo, sheep, goat, dromedaries, pigs, cat, dog, including birds and humans. These worms are cosmopolitan in their distribution. It is the disease caused by the infestation with the parasite nematodes of the genus *Thelazia* of different species that infest different host. The disease is mainly seen in summer and autumn when the flies are active [17]. *Thelazia* infections occur seasonally and are linked to periods of maximum fly activity. The parasite can survive in the eye for several years. The infection may persist in symptomless carrier cattle. Survival of larvae also occurs in the pupal stages of flies during the winter [9].

Thelaziasis is an infestation caused by the parasite *Thelazia* which is transmitted from one host to another host by the intermediate host face fly. Face fly is a non-penetrate secreto-phagic or tear feeding flies of the genera *Musca* (family Muscidae), *Phortica* (family Drosophilidae), or *Fannia*(family Fannidae). Bovine *Thelazia* is transmitted from one to another host by the genus *Musca* (family Muscidae). The species *Musca autuminalis* and occasionally *Musca domestica*, *Musca larvipara* and *Musca amica* transmit when feeding on the tears [7].

Clinical Manifestation: Various clinical signs are associated with thelaziasis including keratitis, conjunctivitis, lacrimation, epiphora, photophobia and corneal opacity [15, 18-19] reports that conjunctivitis in *T. rhodesi* infections coincided with the dying off of adult worms and new infection with young individuals. Oakley [20] described a group of calves showing signs of lacrimation, keratitis and cornial opacity in which the presence of *Thelazia gulosa* was demonstrated. Flies are usually clustered around the eye because of the excessive secretion. In severe cases, the whole cornea can be opaque [4]. The localization of the eye worms in the anterior or posterior chants or in vitreous body and retina, inducing clinical symptom, such as, decreased vision, black spots in visual field, photophobia, excessive

lacrimation ocular congestion, aqueous humor turbidity and sometimes purulent exudates under the anterior chamber [1]. In animal hosts; infestation may be asymptomatic, though it frequently causes watery eyes (epiphora), conjunctivitis, corneal opacity, ulcerative keratitis, follicular hypertrophy of the conjunctiva and secondary bacterial infection may develop. Conjunctivitis and keratitis are common signs. Characteristically there is chronic conjunctivitis with lymphoid hyperplasia and seromucoid exudates[5].

Diagnosis: A diagnosis of thelaziosis is usually made based on visualization of the parasite on the conjunctiva; adult *Thelazia* are very active when looking. The eggs or larvae can be seen when tears or other eye secretions are examined under a microscope. The nematodes, *Thelazia,* can be collected by flushing saline from the medial canthus. The eye secretion should then be submitted to a microscopical parasitic examination to detect the typical new born L1. However, the clinical diagnosis of thelaziosis in animals and humans can be difficult if small number of adults is present. In fact, clinical symptoms mainly caused by third larva (L3) and fourth (L4) immature stages and appear to be similar to those of allergic reactions [5]. With a careful clinical and ophthalmological examination the tangled worms may be seen, mostly in the conjunctival sac and medial or lateral cantus of the eye of infected cattle nevertheless, cases of thelaziasis where the worms were isolated from anterior chamber have been reported [21]. Mostly the clinical feature lacrimation of thelaziosis is identical to foreign body sensations and infectious keratoconjunctivitis (pink eye) but it is differentiated by visually observation of the available adult *Thelazia* on the conjunctiva, tear duct of the eye. The foreign bodies are differentiated by looking the foreign mater in the eye and bovine pink eye have marked pathological changes and by indentifying the causative organism [9].

TEATMENT Adult worms can be removed with fine forceps and by using cotton swabs under local anesthesia. Pharmacological indications include irrigation of the eyes with 50-75 ml aqueous solution of 0.5 % iodine and 0.75% potassium iodide has been recommended for *T. gulosa* and *T. skrjabini* or applied steroid ointment, fenbendazole and Ivermectin subcutaneously [7]. Koyama *et al*.[22] has reported that a subcutaneous dose of 20 ml methyridine produce rapid recovery from *Thelazia* infection, as do tetramosole (15 mg/ kg) and levamisole (5 mg/ kg) given orally or parentraly. These drugs are secreted through the lacrimal glands. However, Michalski [23] found 2 ml of levamisole injected in the subconjunctival sac to be more effective than levamisole given orally. Eye slaves containing 4% morantel tartrate or 1% levamisole have also been used with success.

REFERENCES

1. Otranto, D., C. Cantacessi, E. Mallia and R.P. Lia, 2007. First report of Thelazia callipaeda (Spirurida, Thelaziidae) in wolves (Canis lupus) in Italy. Journal of Wildlife Diseases, 43(3): 508-511.
2. Otranto, D., R.P. Lia, D. Traversa and S. Giannetto, 2004. Thelazia callipaeda (Spirurida, Thelaziidae) of carnivores and humans: morphological study by and scanning electron microscopy. Parasitologia, 45: 125-133.
3. Otranto, D., C.T. Cantacessi, G. Estini and R.P. Lia, 2006 b. Phorticavariegata as an intermediate host of Thelazia callipaeda under natural conditions: evidence for pathogen transmission by a male arthropod vector. International Journal of Parasitology, 36: 1167-1173.
4. Otranto, D., R.P. Lia, C.T. Cantacessi, G. Estini, A. Troccoli, J.L. Shen and Z.X. Wang, 2005a. Nematode biology and larval development of *Thelazia callipaeda* (Spirurida, Thelaziidae) in the drosophilid intermediate host in Europe and China. Parasitology, 131: 847-855.
5. Otranto, D., G.T. Estini, F. Deluca, M. Hu, S. Shamsi and R.B. Gasser, 2005b. Analysis of genetic variability within Thelazia callipaeda (Nematoda: Thelazioidea) from Europe and Asia by sequencing and mutation scanning of mitochondrial cytochrome c oxidase subunit 1. Molecular and Cellular Probes, 19: 306-313.
6. Otranto, D., E. Ferroglio, R.P. Lia, D. Traversa and L. Rossi, 2003. Current status and epidemiological observations of Thelazia callipaeda (Spirurida, Thelaziidae) in dogs, cats and foxes in Italy: a ‘‘coincidence’ ’ or parasitic disease of the Old Continent? Veterinary Parasitology, 116: 315-325.
7. Anderson, R.C., 2000. Nematode parasites of vertebrates, their development and transmission, 2nded. CABI Publishing, UK.
8. Arbuckle, J.B.R. and L.F. Khalil, 1976. Thelazia worms in the eyes of British cattle. Veterinary Record, 99: 376-377.
9. Ebadi, A., 1951. A survey on Thelazia spp. in cattle in Tehran, Iran. DVM thesis no.428, College of Veterinary Medicine, Tehran University, Iran.

10. Fitzsimmons, W.M., 1963. Verminous ophthalmia in a cow in Berkshire-A review of Thelazia infections as a veterinary problem. Veterinary Record, 75: 1024-1027.
11. Giangaspero, A., D. Otranto, N. Vovlas and V. Puccini, 2000. Thelazia gulosa Railliet and Henry, 1910 and T.skrjabini Erschow,1928 infection in southern Europe (Italy). Parasite, 7: 327-329.
12. Guttekova, A., 1987. Ultrastructure of the surface sculpture of the nematodes Thelazia gulosa and Thelazia rhodesi. Veterinary Medicine, 32: 113-120.
13. Koyama, Y., A. Ohira, T. Kono, T. Yoneyama and K. Shiwaku, 2000. "Five cases of thelaziasis." The British journal of ophthalmogy, 84(4): 441.
14. Oakley, G.A., 1969. Thelazia infestation of cattle in Cambridgeshire. British Veterinary Journal 125: p. xxxix-xl.
15. O'Hara, J.E. and M.J. Kennedy, 1991. Development of the nematode eyeworms, Thelazia skrjabini (Nematode: Thelazioidea), in experimentally infected face flies, Musca autumnalis (Diptera: Muscidae). Journal of Parasitology, 77: 417-425.
16. Otranto, D. and D. Traversa, 2005. Thelazia eyeworms: an original endo- and ecto-parasitic nematode. Trends in Parasitology, 21(1): 1-4.
17. Shen, J.L.And R. Gasser, 2006. Human thelaziosis: a neglected parasitic disease of the eye. Journal of Parasitology, 92: 186-190.
18. Soulsby, E.J.L., 1986. Helminths, Arthropods and Protozoa of domestic animals, 7thed. Bailliere Tindall, London, pp: 289-291.
19. Urquhart, G.M., J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings 1996. Veterinary Parastiology, 2nd ed. Blackwell publishing. New York, pp: 79-83.
20. Vilagiova, I., 1967. Results of experimental studies on the development of preinvasive stages of worms of the genus Thelazia, Bosc., 1819 (Spirurata: Nematoda), parasitic in the eyes of cattle. Folia Parasitologica, 14: 275-280.
21. Michalski, L., 1976. The efficacy of levamosole and tetramisole in the treatment of thelaziasis in cattle. Medycyna wet, pp: 32.
22. Lyons, E.T., D.B. Sisk and J.H. Drudge, 1975. Eyeworm (*Thelazia* spp.) in cattle. Modern Veterinary Practice, 56: 260.
23. Moolenbeek, W.J. and G.A. Surgeoner, 1980. Southern Ontario Thelazia Survey of Eyeworms, *Thelazia gulosa* and Thelazia lacrimalis in cattle and larvae of Thelazia spp. In the face fly, Musca autumnalis. Canadian Veterinary Journal, 21: 50-52.